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While the need for health information is a seemingly universal concept, comfort using computers and the Internet is not. Yet studies have shown that users within a large range of years of computer experience search the Internet for health information (“e-health information”) at ever-increasing rates. The purpose of the current study is to discover how a searcher’s attitudes toward and self-perception of their computer and Internet competence affect his or her e-health information-seeking behaviors.

An online survey was distributed with questions that served to measure participants’ computer and Internet anxiety, as well as questions pertaining to their e-health attitudes and search behaviors. Participants’ anxiety levels had a statistically significant effect on participants’ (1) feeling that their e-health searches are generally successful (or unsuccessful), (2) satisfaction with the information obtained, and (3) tendency to share e-health information with a health care provider.

Headings:

Internet in medicine

Health -- Computer network resources

Internet -- utilization

Computers -- Psychological aspects

THE EFFECT OF COMPUTER AND INTERNET ATTITUDES AND ANXIETY ON
E-HEALTH SEARCH BEHAVIORS

by
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Introduction

According to a 2006 Pew study, 80 percent of American Internet users have searched, at one time or another, for medical information online. Moreover, 8 million American adults use the Internet to search for health information on any given day (Pew, 2006). The importance of the Internet as a source of health information is now indisputable; yet the anonymity inherent in Internet use makes it somewhat of a challenge to put a face on its users. And though the demographics of online health information (or “e-health”) seekers have been relatively well studied in recent years, explorations of these users’ search behaviors are fewer in number.

While the need for health information is a seemingly universal concept, comfort with technology, specifically the Internet, is not. Yet studies have shown that users within a large range of ages and years of computer experience search the Internet for health information at ever-increasing rates (Pew, 2006). So, when users who are less comfortable with computing (and may have high levels of anxiety associated with computer or Internet use) turn to the Internet for health information, it seems logical to suggest that their search behaviors might look quite different from those of a confident user. Thus, the purpose of the current study is to discover how a searcher’s attitudes toward and self-perception of their computer and Internet competence affect his or her e-health information-seeking behaviors.

Literature Review

Demographics of e-Health Seekers

Many earlier studies have investigated the demographics of e-health seekers. According to Atkinson, Saperstein, and Pleis (2009), significant variables determining whether one is likely to search for health information online include gender, education level, number and age of children, location and type of Internet access, and frequency of Internet use. Other studies with similar findings have also added age to this list (Pew, 2006; Dolan, Iredale, Williams, & Ameen, 2004). More specifically, the groups that appear most likely to access health information online are women, searchers under age 65, college graduates, frequent Internet users, and searchers with broadband access at home (Pew, 2006). Clearly, patterns have emerged to paint a picture of *who* searches for online health information; however, the factors affecting *how* users search for that information are more nebulous.

Why Search for Health Information Online?

There are many possible motivations for undertaking an online search for medical information, including a diagnosis affecting the searcher or someone he or she knows, new medications or treatment plans, coping with an ongoing condition, unanswered questions after a visit to the doctor, a change in diet or exercise regimen, or acting as a caregiver for someone else. Some of the most popular health topics researched on the Internet include (in order) diseases or medical problems, treatments and procedures, diet and nutrition, exercise, medications, and alternative medicine (Rice, 2006). Yet much of this information was available from a variety of sources before the advent of the Internet; what, then, makes the Internet such an appealing source?

For those who have Internet access at work or in their homes, the availability, flexibility, and convenience of e-health seeking may be reason enough to use it over other sources of health information. However, several other factors may also influence a searcher's decision to use online sources. For one, gathering information directly from medical professionals (a traditional source of health information) may be inconvenient, time consuming, or even intimidating. Salo et al. (2004) list several factors that can impede patients' attempts to gather information directly from physicians, including time limitations, the "unidirectional nature" of the patient-doctor relationship, and the variable skill of the individual physician. Searching the Internet, on the other hand, puts patients in control of both the information gathering process and their personal privacy. In the same study, 80 percent of those surveyed mentioned that they liked the "anonymous nature" of Internet searching, and 50 percent said that they used the Internet to search for information about sensitive or embarrassing health topics.

Being able to quickly compare and contrast information from two or more sources is another advantage of e-health searching. Through consensus, searchers may be able to determine the reliability of the information they find (Adams, de Bont, & Berg, 2006). Moreover, the fact that both up-to-date information and continuously operating support groups abound on the Internet seems to contribute to the Internet's popularity as a viable information source. While many patients with chronic illnesses feel that static sources such as books become less important as time passes after their diagnosis, the Internet maintains its relevance for their information needs (Eysenbach, 2003).

The Internet can also prove to be a useful source after a visit to the doctor's office. Many patients say they turn to the Internet when information from their physician

is unsatisfying or is perceived as being incomplete. Indeed, patients who tend to use the Internet to search for health information are more likely to be unsatisfied with information provided by a doctor (Eysenbach, 2003). Such patients may have much higher expectations of their physician's ability to provide information (and may be more easily disappointed) because of their knowledge of how much information is available.

Regardless of why patients are dissatisfied with traditional sources of health information, this dissatisfaction often leads to an Internet search to fill in informational gaps. Even in the absence of dissatisfaction, patients may turn to the Internet as a coping mechanism, hoping to glean all the information they can about a particular condition (Eysenbach, 2003).

Pitfalls of e-Health Information

Despite its appeal, the quality of e-health information often suffers due to the democratic nature of the Internet. As such, a certain level of skill is required on the part of the searcher to discern quality sources from incomplete, misleading, or nonfactual information. It is difficult to estimate what proportion of available e-health information amounts to misinformation; aside from the near-impossibility of combing through all available online sources, determining quality is, by its nature, a subjective process. It should also be noted that the mere existence of misinformation is not necessarily a case against e-health searching; as with any source of information, the searcher's risk of finding inaccurate information is dependent on a combination of the rate at which misinformation occurs *and* the searcher's skill level in discerning quality (Eysenbach, Powell, Kuss, & Sa, 2002). Regardless, in a systematic review, Eysenbach et al. (2002)

determined that 70 percent of the included studies concluded that “quality is a problem on the Internet.”

E-health “information overload” may be just as damaging as misinformation. With so much information available, much of which may be far outside lay searchers’ realm of expertise, searchers are burdened with the responsibility of sorting, prioritizing, and judging the quality of information they may not wholly understand. A special case exists when patients use the Internet in attempts to self-diagnose, essentially stepping into the role of a health professional. Such users are in danger of wandering into the territory of so-called “cyberchondria,” or the “unfounded escalation of concerns about common symptomatology” based on information found on the Internet (White & Horvitz, 2009). As an example, White and Horvitz found that a web search for “headache” was just as likely to bring up sites suggesting the cause to be something common and benign, such as caffeine withdrawal, as sites suggesting the possibility of a brain tumor (a much less likely cause of headaches). Whereas a physician would not likely broach the possibility of a tumor in a personal interaction with a patient without very good reason, the Internet is incapable of such value judgments.

If e-health information is misleading or misinterpreted and leads to self-diagnosis, patients may request that their doctors perform inappropriate interventions; in turn, a doctor may then perform these interventions out of concern that refusal could damage the patient-physician relationship (Murray et al., 2003). This pattern of behavior is an example of how mishandled e-health searches can be disadvantageous not only for the searcher, but for health care providers.

Over-reliance on search engines may also lead a searcher to poor-quality information. The majority of e-health seekers tend to start their search process with search engines (rather than medical websites) (Eysenbach and Köhler, 2002), yet many use unsophisticated search terms and methods to retrieve results, and most never venture beyond the first one or two pages of search results (Morahan-Martin, 2004). As an example, a May 2011 Google search for “migraine” pulled up over 21 million results, with only 14 links appearing on the first page of results. Out of those 14, the first three results were sponsored links (that were, incidentally, barely differentiated from the rest of the links of the page) leading to sites selling prescription and over-the-counter medicine. Relying solely on this first results page, then, drastically increases the searcher’s chances of retrieving biased or misleading information.

Previous studies have discussed the “sponsored link” problem in depth, as searches for certain diseases may consistently bring up sponsored links for sites hawking untested alternative medicine, or even outright scams. A study by Walji et al. (2004) used search engines to find information on 10 cancer-related keywords. Of the results returned, over 28 percent were sponsored links, and over 16 percent were alternative medicine sites. These percentages suggest that there is a high probability that a searcher inexperienced with discerning reliable sources will eventually land on such a site.

Crocco, Villasis-Keever, and Jadad (2002) note that while there are very few documented cases of actual harm resulting from a patient’s use of biased or misleading e-health information, there may be many instances of physical, emotional, or financial harm that simply go unreported. The 2006 Pew study notes that 3 percent of health seekers reported that they or someone they know have been harmed by following online

health advice. The relative dearth of documented instances, however, tends to suggest that the Internet's capacity for providing good, useful health information outweighs its capacity to do harm.

A theme runs through each of these pitfalls of e-health information, in that each disadvantage requires a certain level of skill on the part of the searcher in order to overcome it. For less confident computer and Internet users, and especially those with some degree of anxiety, this skill set may not be fully developed.

How Do e-Health Seekers Determine Information Quality?

Studies have shown that many searchers are in fact able to differentiate between quality and poor sources of e-health information—though many may often neglect to follow their instincts. User methods of judging the quality of online health information are as varied as the individuals using them. Still, participants in Tang and Lee's (2006) study agreed on the importance of navigating to "credible institutional sites," verifying any information found with another source, and using "common sense."

Perceived "completeness" of information can also have a significant effect on a source's perceived credibility. Dutta-Bergman (2004) "planted" three information sources concerning the relationship between tea and heart health on a health-related website. All articles were of the same length, cited the same sources, and dealt with the same subject, yet two out of three articles were written so as to lack the "grounds, warrants, backing, and method" of the third, more complete article. When asked to assess the sources' credibility, users perceived the more complete article to be significantly more credible than the others. Thus, while the sources of the information were seemingly unimportant to the perception of credibility in this study (as all articles contained the

same citations), it was shown that users pay attention to the message itself and judge it accordingly.

It is thus apparent that users know that they *should* attempt to verify the credibility of the health sites they visit, but do they actually follow through in practice? Eysenbach and Köhler (2002) questioned study participants about how they determine the credibility of health websites. The participants deemed big-name “official” authorities, a professional look, clear writing, and citations to scientific references as factors in positively evaluating a website’s credibility. Interestingly, however, when these same users’ search behaviors were observed, it was found that few participants actually paid attention to or retained the name of the company or organization behind any given site, despite naming this as an important criterion. This conclusion is echoed by the 2006 Pew study, which found that the vast majority of seekers of online health information do not consistently check sources and dates on medical websites.

Searchers have also been found to frequently “reject” sites not for lack of credibility, but for design flaws (busy layout, difficult navigation, “boring” design, pop-ups, slow loading, etc.) (Sillence, Briggs, Harris & Fishwick, 2007). This suggests that well-designed sites lacking credibility could potentially be preferred over credible sites with design flaws.

Despite searchers’ apparent laxity in vetting information, most have a positive attitude about e-health information in general. Most feel that their searches are successful, and most say that most or all of the information found online can be trusted (Morahan-Martin, 2004). There thus appears to be a disconnect between searchers’ stated intentions and their actual search behaviors.

e-Health Search Behaviors

The e-health information-seeking process is more than just discerning good information from bad. Users must also have a process by which they obtain that information—a pattern of e-health search behaviors. Certain e-health search behaviors have been the subject of earlier studies. Eysenbach and Köhler (2002) found that searchers generally use a search engine at the start of their e-health searches, as opposed to starting from a specific website specializing in medical information. The 2006 Pew study echoed this conclusion, adding that younger searchers are more likely to begin with a search engine, while older searchers tend to start at a trusted medical website. The Pew study also determined that most searchers use two or more health information websites to gather information for a single search.

Sillence et al. (2007) suggest that most searchers follow a “staged model of trust” when assessing online information quality. In the first stage, searchers visit a wide variety of sites, quickly rejecting or tentatively accepting each site based solely on superficial characteristics (such as design). In the second, “analytic” stage, the searcher investigates the chosen material more closely. Following this assessment, the searcher selects a small number of sites with which to develop a long-term, trusting relationship. In contrast, Adams, du Bont, and Berg (2006) found that while some e-health seekers do in fact appear to be “loyal” to certain health information websites (as Sillence et al. found), searchers’ true loyalty may actually lie with their particular information-seeking *process*. Adams et al. found that users develop patterns of searching, and whether that process includes using a single site, a group of sites, or picking and choosing among search-

engine results, this process tends to remain consistent even when the subject of the search changes.

Computer Anxiety and Search Behaviors

Joiner et al. (2005) define computer anxiety as “the irrational anticipation of fear evoked by the thought of using (or actually using) computers, the effects of which result in avoiding or minimising computer usage” (p. 2). Such a definition could be easily extended to the Internet as well, though “Internet anxiety” has only recently emerged as its own concept. However, differentiating between computer anxiety and Internet anxiety is not always straightforward, as the two are closely related. Despite this close relation, Liaw (2002) found very few prior studies that consider computer attitudes and Internet attitudes at the same time or, indeed, study the relationship between computer and Internet attitudes. Liaw’s own study found a very significant positive correlation between computer and Internet attitudes, suggesting that one measure could effectively predict the other. With the Internet being an almost unavoidable part of modern computing, it is valuable to know that a high level of anxiety concerning one may very well predict a high level of anxiety concerning the other.

But does computer and/or Internet anxiety influence patterns of e-health search behavior, or attitudes about e-health searching? Few e-health studies specifically ask participants to self-assess their level of computer or Internet competency (being instead more likely to ask about years of Internet experience, frequency of Internet use, or another similar metric). However, time spent using computers or the Internet is not necessarily indicative of one’s level of comfort, and experience measured in time may not capture all aspects of computer and Internet knowledge. Potosky (2006), whose work

focuses specifically on attitudes toward the Internet, points out the flaw in a time-based measure of experience: depending on prior computer and Internet experience and knowledge, any two users may require vastly differing amounts of time to achieve the same level of mastery. Moreover, Rosen and Maguire (1990) assert that “[For computerphobics], each additional computer experience strengthens their negative affective reactions and promotes further computer avoidance” (quoted in Rosen, Sears, & Weil, 1993, p. 28). Thus, Potosky (2006) suggests that a user’s amount of exposure to the Internet is not a substitute for a direct measure of “Internet knowledge,” defined as a combination of knowledge *about* the Internet (e.g., being able to define “browser” or “cookie”) and being able *use* the Internet to complete a variety of tasks (e.g., apply for a job, make a purchase, or successfully retrieve information).

Further flaws in the system of using computer or Internet exposure time as an indicator of anxiety have been pointed out by studies finding no significant relationship between computer anxiety and computer experience (e.g., Mahar, Henderson, and Deane (1997)). Though prior studies have found a positive relationship, as a whole, the evidence is mixed. This led McIlroy, Bunting, Tierney, and Gordon (2001) to assert that evidence of a significant relationship, despite being the subject of numerous studies, is “inconclusive.” This suggests that the concept of “experience,” as it relates to anxiety, must be broken down further than simply number of years of exposure to computers.

Brosnan (1998) asserts that while experience and anxiety may have no significant relationship to each other, each exerts significant influence on computer *self-efficacy*. Self-efficacy refers to one’s ability to take the necessary steps in order to accomplish a given task and, according to Brosnan, predicts task performance. A combination of a high

level of anxiety and lack of experience can lead to low self-efficacy, which may in turn lead to choosing less-than-ideal computing task completion strategies and poorer task performance overall. Yee et al. (2004) concur, again finding that a user's feelings of self-efficacy and anxiety influence performance levels on various computer tasks. Yee et al. also note that intrusive, anxious thoughts have a negative effect on the success of Internet searches in particular. It seems likely, then, that an e-health searcher with a high level of computer anxiety may be more likely to use flawed search strategies, retrieve poorer results, and leave less satisfied with the results of the search process.

A 2008 study concerning e-health search behaviors did, in fact, ask participants to rate their level of computer competency, and found that those who rated their competency level as "average" or "fair to poor" were less likely to search for health information online in the first place (Dey, Reid, Godding, & Campbell, 2008). Yet certainly there were participants in this group who searched the Internet despite their perceived low level of competency—how then, did their search behaviors differ from those of the more confident computer users?

Study Rationale

The importance of studying the factors that determine search behaviors is summed up by Ybarra and Suman (2008), who assert that due to the Internet's ever-increasing role as a health information resource, researchers will better serve users by moving beyond studies bemoaning the poor quality of health information on the Internet and focusing instead on the "seeking experience" itself. Moreover, Rogers and Mead (2004) warn of the danger of creating a "dichotomized 'information rich' and 'information poor' society," where access to high-quality online health information is

determined by one's level of computer competency. This is the oft-cited "digital divide," where access to information is a privilege limited to certain groups with regular access to (and experience using) computing resources.

Murray et al. (2003) point out that the Internet actually has the potential to democratize quality health information, *if* disadvantaged groups are (1) able to access it and (2) able to distinguish good information from bad. Indeed, Murray discovered that once a method of Internet access was established, socioeconomic status and education level became statistically insignificant in determining the success of participants' e-health searches. Yet in the same study, only one-third of participants were confident in their own ability to determine whether e-health information was reliable. Discovering how computer self-efficacy affects search behaviors, then, could be highly instructive in future attempts to develop user education efforts and online health information quality standards. As more and more people use the Internet as a source of health information, such efforts could begin to bridge the information quality gap between searchers of differing competency levels.

Methodology

In April 2011, a link to an online survey concerning computer and Internet attitudes and e-health search behaviors was sent to the all-UNC email listserv reaching all UNC faculty, staff, and students. Survey participants were eligible for inclusion if they reported that they were 18 years of age or older. The survey is comprised of four parts: (1) demographic questions, (2) a 15-item Computer & Internet Attitudes and Anxiety Scale (CIAAS, described in greater detail below), (3) questions concerning e-health

search behaviors, and (4) a short exercise to determine the reliability of a health website. A reproduction of the actual survey questions is included here as Appendix A.

Data Cleaning

The initial result set contained 222 observations. One survey participant declined consent, and was removed from the result set. Seventeen additional participants were removed due to their submission of blank or mostly blank surveys. Two hundred and four surveys were included in the final analysis.

The CIAAS

The construction of the CIAAS is worth delving into, as participants' scores on this measure were used as a basis for much of this study's statistical analysis. The CIAAS is a 15-item survey that serves to evaluate the respondent's level of computer and Internet anxiety. It is comprised of selected questions from Schulenberg and Melton's (2008) computer aversion, attitudes, and familiarity index (CAAFI); Potosky's (2006) "iKnow" measure of Internet knowledge; and five additional questions.

There are many existing computer anxiety, attitude, and aptitude tests (such as the highly cited computer anxiety rating scale, or CARS (Heinssen, Glass & Knight, 1987)), yet there is no one universally accepted scale (Liaw, 2002). Moreover, few such surveys are contemporary enough to include relevant questions about modern computing or the Internet. Indeed, a 2004 study by Barbeite and Weiss found that prominent computer anxiety surveys originating in the 1980s (including the CARS) lost validity when administered to a sample population recruited and tested on the Internet. Because respondents to online surveys (such as the one used in this study) necessarily have some access to the Internet (and some experience using computers), new computer anxiety

scales must be developed in order to be more relevant to this population. In addition, because the formal evaluation of Internet-specific attitudes and anxiety (as opposed to computer attitudes and anxiety) is a relatively recent endeavor, there are few scales available that ask questions specifically pertaining to the Internet.

The CIAAS is thus a combination of the CAAFI and the iKnow, with the addition of five original questions touching on additional aspects of Internet anxiety. Schulenberg and Melton's (2008) CAAFI includes questions covering each of the following factors: (1) computer familiarity, (2) computer attitudes, (3) computer aversion—discomfort, and (4) computer aversion—fear. Potosky's (2006) iKnow is comprised of questions covering two areas of Internet use—information search and email. For this study, the CIAAS retained three questions from each of the CAAFI factors (with factors 3 and 4 considered as a single category) and three questions from the iKnow's information search factor; questions from the iKnow's email factor were eliminated, as they were irrelevant to the current study. Three original questions (“I avoid online shopping because I don't like to give out my credit card information on the Internet,” “I can easily identify ‘scam’ websites when I encounter them,” and “I feel safe when surfing the web”) were added to explore a factor that neither the CAAFI nor the iKnow covered—feelings of paranoia or aversion while using the Internet. The CIAAS is thus a five-factor survey, with items pertaining to each of the following categories: (1) computer familiarity, (2) computer attitudes, (3) computer aversion, (4) Internet familiarity, and (5) Internet aversion.

The CIAAS uses a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Questions are worded both positively and negatively, causing some items to be reverse-scored. All items are weighed equally in calculating the final score,

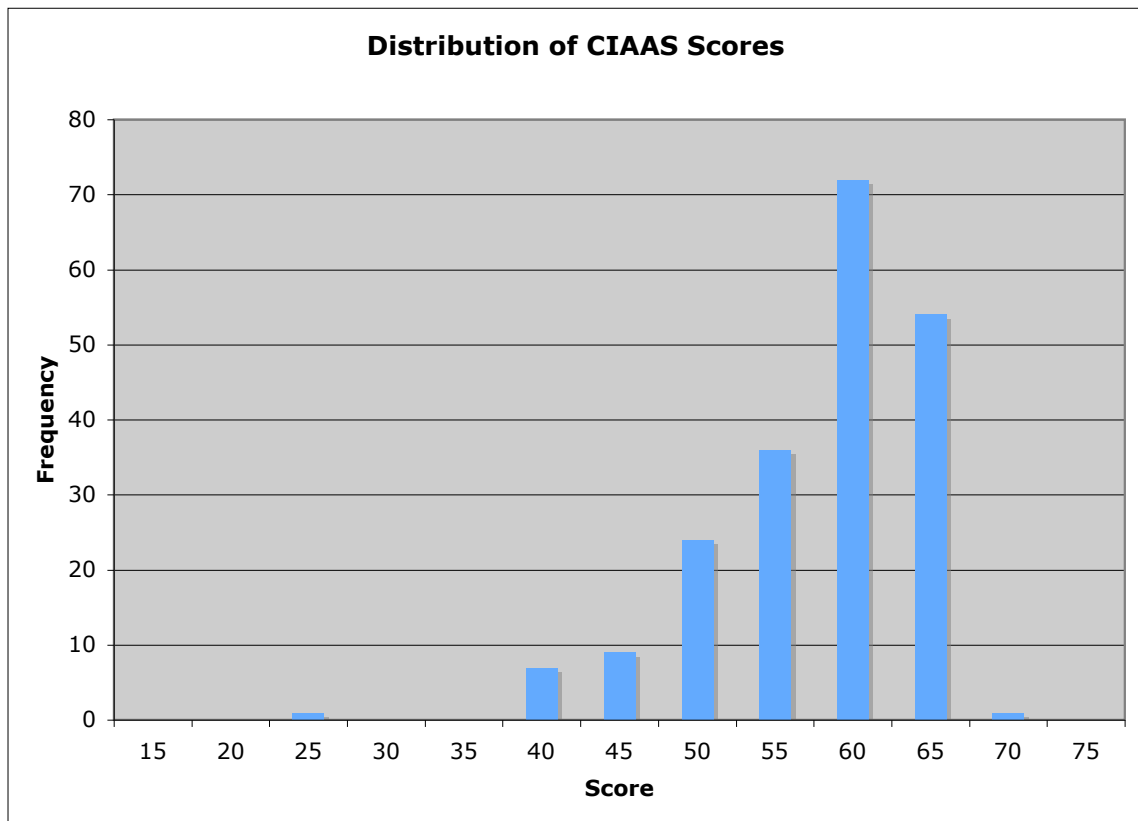
and each participant is allowed one missing answer. In cases where a single answer was missing, the missing value was filled in with the mean of the remaining values. None of the included participants left more than one item blank.

Results

Preliminary Analysis

CIAAS scores were distributed as shown in Figure 1. Possible scores ranged from 15 to 75, with 15 being the most anxious, and 75 being the least anxious. For the purpose of this study, scores less than 46 were defined as “Moderate Anxiety,” scores between 46 and 60 were defined as “Some Anxiety,” and scores 61 and above were defined as “Little to No Anxiety.”

Figure 1



A preliminary phase of analysis was undertaken to determine if any of the common demographic variables often found to be significant in studies of e-health searching (gender, age, education level, etc.) had a significant effect on participants' CIAAS scores. After dividing participants into three groups based on their CIAAS scores (those with moderate anxiety, some anxiety, and little to no anxiety), chi-square tests revealed two significant demographic variables: presence or absence of an Internet connection in the home, and frequency of Internet use. (See Table 1, on the following page.) Those with broadband access at home were much less likely to have high levels of anxiety than those with dial-up home access or no home access. Moreover, anxiety was shown to have a significant inverse relationship with frequency of Internet use (measured in hours per day).

CIAAS Scores and e-Health Search Behaviors

In the second phase of analysis, CIAAS scores were compared with respondents' answers to various questions concerning their e-health search behaviors and attitudes, in order to determine if anxiety has any significant effect on search behaviors. Table 2 shows these effects. Using ANOVA, CIAAS scores were found to have a significant positive relationship to participants' (1) feeling that e-health searches are generally successful (or unsuccessful), (2) satisfaction with the information obtained, and (3) tendency to share e-health information with a health care provider. Those participants with lower levels of anxiety were more likely to feel that their searches were successful, be satisfied with the information obtained, and choose to share that information with a doctor.

Table 1					
<i>Study participant demographics and their effect on CIAAS scores</i>					
	All (n=204)	Moderate Anxiety* (n=17)	Some Anxiety† (n=132)	Little / No Anxiety§ (n=55)	p-value
Gender					0.91
Male	16.7%	8.8%	67.6%	23.5%	
Female	83.3%	8.2%	64.1%	27.6%	
Age					0.17
18-24	14.7%	3.3%	63.3%	33.3%	
25-34	23.0%	2.1%	59.6%	38.3%	
35-44	14.2%	10.3%	62.1%	27.6%	
45-54	19.6%	7.5%	67.5%	25.0%	
55-64	22.1%	13.3%	71.1%	15.6%	
65+	6.4%	23.1%	61.5%	15.4%	
Education					0.29
GED / high school	2.0%	0.0%	50.0%	50.0%	
Some coll. / tech. sch.	18.6%	5.3%	63.2%	31.6%	
College grad	15.2%	12.9%	51.6%	35.5%	
Some post-graduate	16.2%	6.1%	57.6%	36.4%	
Post-graduate degree	48.0%	9.2%	72.4%	18.4%	
Internet at home					< 0.001
Yes, broadband	94.6%	6.2%	65.3%	28.5%	
Yes, dial-up	1.5%	33.3%	67.7%	0.0%	
No	3.9%	50.0%	50.0%	0.0%	
Daily Internet Use					< 0.001
8+ hours	13.7%	3.6%	57.1%	39.3%	
3-7 hours	60.8%	2.4%	66.9%	28.2%	
1-2 hours	22.5%	21.7%	58.7%	19.6%	
< 1 hour	2.9%	50.0%	50.0%	0.0%	

* Moderate anxiety defined as scores < 46

† Some anxiety defined as scores ranging from 46 to 60

§ Little to no anxiety defined as scores > 60

Table 2		
<i>CIAAS scores' effects on search behaviors</i>		
	Mean CIAAS Score (n=201)	p-value
When using a search engine to find online health information, if you do not find the information you're looking for on the first page of search results, are you most likely to:		0.494
Go to the next page of results	54.65	
Change your search terms	56.16	
Use a different search engine or website	55.00	
Other	57.80	
If you ever cannot find the health information you're looking for on the Internet, do you...		0.683
Assume the information is not available on the Internet	54.76	
Assume you are not using the right search terms	55.92	
Assume you are searching in the wrong place	55.00	
Other	53.50	
In general, how often do you feel your online searches for health information are successful?		< 0.001
Rarely	48.00	
Sometimes	53.25	
Often	56.82	
In general, how satisfied have you been with the quality of health information you've gotten from the Internet?		0.017
Dissatisfied	48.00	
Neutral	53.49	
Satisfied	56.22	
Very satisfied	57.23	
Do you ever share health information that you've gotten from the Internet with your doctor?		0.006
Never	52.80	
Rarely	53.86	
Sometimes	56.36	
Often	58.60	

The behaviors listed in Table 2 that did not have a statistically significant relationship to CIAAS scores are also worth noting, as their descriptive statistics echo the findings of prior studies. The vast majority of respondents (68 percent) reported that, when searching for e-health information, they do not move past the first page of search

results if their search is unsuccessful at first glance, but rather change their search terms and try again. Only 27 percent of respondents ever move past the first results page.

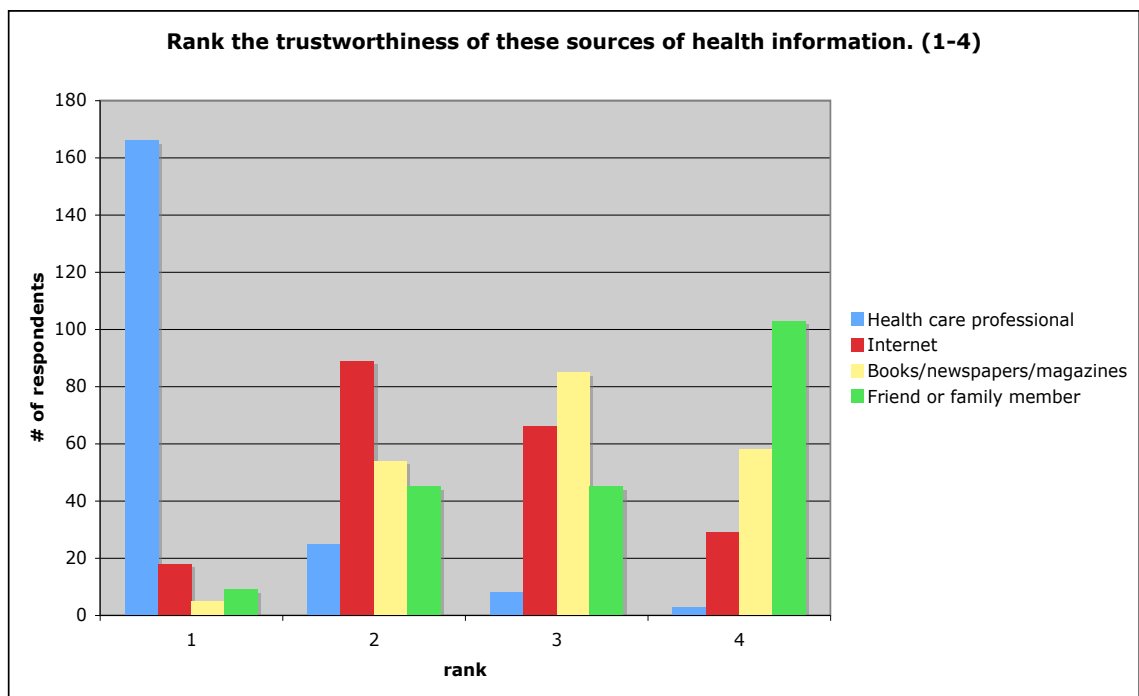
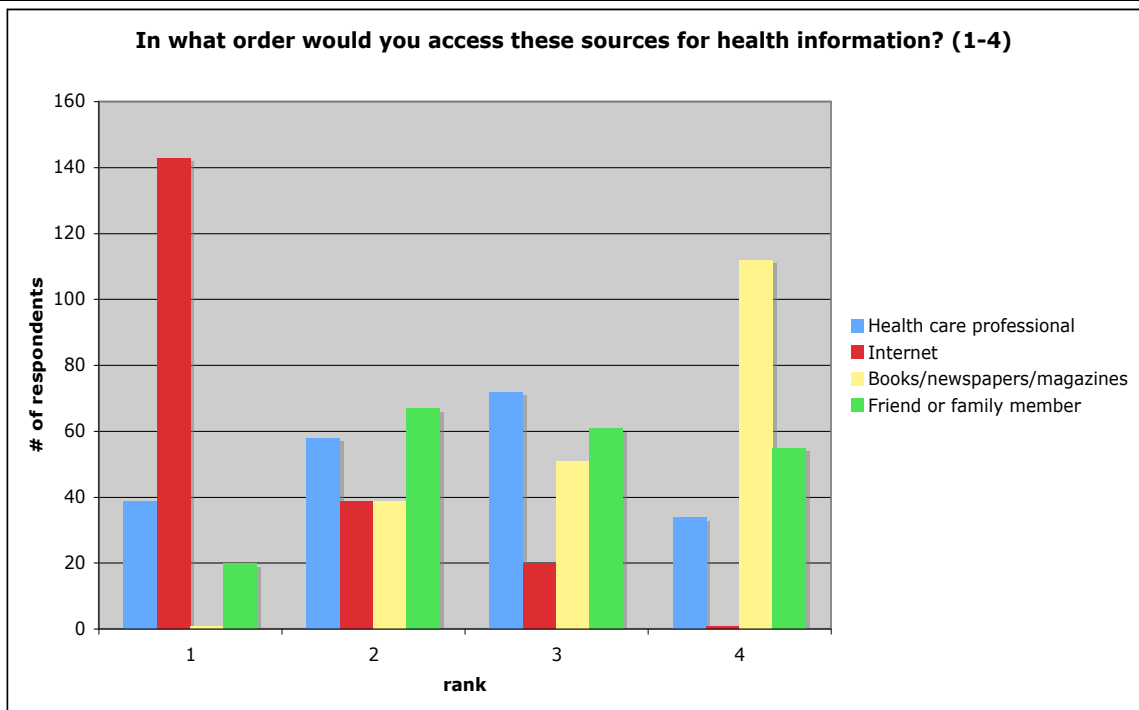
Participants also seemed to have a great deal of faith in the completeness of health information available on the Internet. When respondents are unable to find the information they're looking for, only 12 percent assume the information is simply not available on the Internet. Seventy percent of respondents, on the other hand, believe that an inability to find information is due to using the wrong search terms, and 14 percent believe that they are searching using the wrong site.

Source Access and Trustworthiness

The data also show a distinct disconnect between the order in which respondents choose to access different sources of health information and the trustworthiness they assign to those sources. Respondents were asked to rank four different sources of health information (health care professional, the Internet, books/newspapers/magazines, and friend or family member) in the order in which they would access them, as well as in terms of how trustworthy they are. Figure 2 provides a graphical representation of the results.

The Internet was the first source accessed by the vast majority of respondents, but was rarely deemed the most trustworthy. The most trustworthy source, health care professionals, was accessed first much less frequently, and was often chosen third or even last (despite very few respondents rating this source third or last in trustworthiness). Friends and family and books, magazines, and newspapers were both chosen last and ranked least trustworthy more frequently than either of the other two sources.

Figure 2



Website Evaluation

CIAAS scores did not have a significant effect on participants' judgments of the survey's sample website, a Medicinenet.com overview of fibromyalgia (available at <http://www.medicinenet.com/fibromyalgia/article.htm>; a screenshot is included here as Appendix B). Medicinenet was chosen as a sample because (1) it is not necessarily a household name (like WebMD, for example), and thus is less likely to be subject to participants' preconceived notions; and (2) it is ostensibly reliable (though, as is evident from participants' responses, this is debatable), as it displays the HONCode symbol and is actually associated with WebMD. However, the site also features many advertisements, mostly from pharmaceutical companies. The intention was for it not to be immediately clear whether the site was in fact reliable, thus requiring some critical thinking on the part of the participant.

Participants were asked to take a few moments and look over the webpage to get an overall impression, judge whether they would consider using the site in the future as a good source of health information, and then add comments explaining their choice. There was no "right" answer to this question; the intention was merely to see if CIAAS scores tended to affect participants' reliability judgments, and to compile a list of what participants noticed about the page in making their decision.

Table 3				
<i>The effect of CIAAS scores on reliability judgments</i>				
Is the sample website a good source of health information?	All (<i>n</i> =196)	Moderate Anxiety (<i>n</i> =16)	Some Anxiety (<i>n</i> =125)	Little / No Anxiety (<i>n</i> =55)
Yes	67.9%	87.5%	62.4%	74.5%
No	12.2%	0.0%	18.4%	1.8%
Don't Know	19.9%	12.5%	19.2%	23.6%

As can be seen from Table 3, a great majority of participants found the site to be a good source of health information. No statistically significant relationship was found between participants' CIAAS scores and their judgment of the site, however.

Despite the lack of a statistically significant relationship, participants' comments about the site were quite informative, as they brought to light the aspects of e-health websites that users tend to notice when determining source credibility. Tables 4a and 4b provide detailed lists of frequently mentioned points (i.e., points that were brought up in at least two separate comments), with "comprehensive information," prominently displayed author credentials, and well-organized information leading the positives (Table 4a), and number and type of advertisements (that is, pharmaceutical ads) heading up the negatives (Table 4b).

Table 4a	
<i>Positive participant comments about the sample website</i>	
	% of total comments
Comprehensive information	11.51%
Authors & credentials displayed	9.86%
Good organization of information	8.77%
Relevant links	7.40%
Association w/ WebMD	4.66%
Good overall page design/layout	3.84%
Useful diagrams and graphics	3.29%
Certifications displayed (e.g., HONCode)	3.29%
Presence of FAQs	2.47%
Interactive media (e.g., quizzes, symptom checker)	1.64%
Medical terms were defined	1.37%
Easy navigation	1.37%
Not overtly commercial	1.37%
Patient discussion feature available	1.37%
Privacy and other policies displayed	1.10%
Article has citations	1.10%
Article is well written	0.82%
Presence of relevant advertising	0.82%
Used the site before	0.82%
Not a message board/blog	0.55%
No pop-ups	0.55%
Unintrusive/well-marked ads	0.55%

Table 4b	
<i>Negative participant comments about the sample website</i>	
	% of total comments
Lots of ads	9.04%
Pharmaceutical ads	5.21%
Page is too "busy"	4.66%
Unfamiliar name/site backers	2.74%
Poor overall page design/layout	2.47%
.com instead of .gov, .edu, or .org	1.92%
Suspected biased/inaccurate info (due to ads)	1.37%
Not academically affiliated	1.10%
Lack of primary literature citations	0.82%
Grotesque images	0.55%

Participants were also asked if they would consider sharing the information on the Medicinenet website with a doctor. Table 5 presents these results, grouped by participants' responses to the prior question (asking whether they thought the site was a reliable information source).

Table 5
<i>Sharing e-health information with a doctor</i>
Among those who thought the site was a good information source:
69.2% would share the information with a doctor
4.5% would not share the information with a doctor
26.3% didn't know if they would share the information with a doctor
Among those who did not think the site was a good information source:
39.1% would share the information with a doctor
39.1% would not share the information with a doctor
21.7% didn't know if they would share the information with a doctor
Among those who did not know if the site was a good information source:
23.6% would share the information with a doctor
15.8% would not share the information with a doctor
60.5% didn't know if they would share the information with a doctor

Interestingly, among those who did not think the site was a good source of e-health information (for various reasons), a significant percentage of participants would still feel comfortable sharing information found there with a doctor.

Discussion

Preliminary Analysis

In the initial demographic analysis, the presence or absence of broadband Internet at home and daily frequency of Internet use were found to have statistically significant relationships with participants' CIAAS scores: those with home broadband access and more frequent Internet users were less likely to have high levels of computer and Internet anxiety. This does suggest that increased exposure to the Internet may lead to higher Internet self-efficacy and, therefore, lower levels of anxiety concerning Internet use. It would perhaps be an oversimplification to suggest that Internet exposure could completely predict a user's level of anxiety, but the degree of significance does suggest that, in the context of e-health searching, exposure (measured in hours of use per day) provides a good approximation of anxiety.

CIAAS Scores and e-Health Search Behaviors

In the second phase of analysis, CIAAS scores were compared with participants' responses to questions concerning their e-health search behaviors and attitudes. CIAAS scores were shown to have a statistically significant effect on three aspects of e-health searching: (1) how often the searcher feels his or her searches for e-health information are successful, (2) the searcher's satisfaction with the quality of the e-health information retrieved, and (3) how often the searcher shares e-health information with a health care professional. Each aspect is considered individually below:

Success of e-health searches: The fact that individuals with lower CIAAS scores (i.e., higher levels of anxiety) are less likely to feel that their e-health searches are successful makes sense in the context of both Brosnan (1998) and Yee et al. (2004), each of whom assert that heightened levels of computer and/or Internet anxiety lead to poorer task performance. E-health searching is the task in this case, and “poorer performance” translates to a smaller likelihood of search success. Moreover, the lower self-efficacy that accompanies high levels of anxiety means that anxious searchers are less confident in their ability to search in the first place; thus, even if they successfully obtain search results, anxious searchers may be less confident that they have unearthed quality information.

Satisfaction with information quality: Lower CIAAS scores (and, therefore, higher anxiety and lower self-efficacy) also affect how a searcher evaluates the quality of available e-health information. Parsing health information displayed on a webpage involves much more than simply reading text on a screen; rather, a searcher must possess a skill set specific to the task of online information evaluation in order to proficiently determine quality. In the context of the Internet, evaluative questions must be asked and answered that simply do not apply to more traditional health information sources: Is this website overly commercial? How many advertisements are acceptable before reliability becomes suspect? Has this website been updated recently? Searchers with low self-efficacy may not possess this skill set, or may not have confidence in their ability to discern quality. Without confidence and experience, important factors affecting the quality of e-health websites may never be considered, blurring the lines that separate quality online information from misinformation. Therefore, low self-efficacy may

frequently lead high-anxiety searchers to information of poorer quality, explaining the fact that these searchers are more likely to be dissatisfied with the overall quality of e-health information.

How often information is shared with a health professional: This finding makes sense in the context of the two preceding findings—if a high-anxiety searcher has less success in finding information in the first place, has difficulty discerning high-quality information, and is frequently unsatisfied with the results obtained, it follows that such a searcher would be hesitant to share this information with a doctor. Searchers who are more convinced of the relevance and quality of their chosen sources may be more confident in ultimately discussing their findings with a health care professional.

CIAAS scores did not have a significant effect on two e-health search behaviors: (1) the steps participants take after failing to find good information on the first page of search results, and (2) participants' attitudes concerning failed searches. Each is considered individually below:

First-page failure: The fact that only 27 percent of respondents ever venture past the first page of search results suggests that failure to achieve success on the first page of results is actually equated with search failure on the part of most respondents. Most respondents (68 percent) reported starting over with new search terms if they were not satisfied with the first page of results; 2 percent switched to a different search engine entirely. The first page of results, then, is given special significance regardless of a user's anxiety level; first-page results may be seen as being of higher quality than second- or third- page results. The instant gratification of the Internet may also come into play here—because information on the Internet is so often immediately available, on occasions when digging

slightly deeper may be required, the user may instead assume that they have done something wrong.

Failed search attitudes: When unable to find the information they're seeking, only 12 percent of respondents assume that the information simply isn't available on the Internet. This suggests that most e-health seekers, regardless of computer anxiety, have faith that most all of the e-health information they may be seeking exists somewhere on the Internet—they may just not know how to find it. Participants thus seem to have a great deal of faith in the “completeness” of the Internet's health information knowledge base, and less faith in their own ability to search effectively.

When searches fail, 70 percent of participants assume they are not using the right search terms, placing the blame for a failed search on the searcher, not the information source. This vision of the Internet as a source for information on any and all medical topics goes a long way toward explaining its immense popularity as a source of health information.

Source Access and Trustworthiness

The fact that the Internet is often the first source turned to for health information *regardless* of computer anxiety is perhaps unsurprising. Of the four options given in the survey (Internet, health care professional, books/magazines/newspapers, and friend or family member), assuming Internet access is available, the Internet may simply be the most convenient (and most private) choice for most searchers, and may be ideal for an initial sweep of available information. In a way, this finding bolsters the purpose of this study, which assumes from the start that the ubiquity and convenience of the Internet has enticed searchers with a wide range of anxiety levels to use the Internet to seek health

information, and that computer or Internet anxiety would not necessarily prevent a searcher from using the Internet as a primary source. The fact that an Internet search is a first step for the majority of health information seekers reveals that even those searchers with high anxiety levels do not avoid e-health searching altogether—conversely, they may make heavy use of the Internet.

And yet, as proved by the huge discrepancy between the two graphs in Figure 2, using the Internet as a first source for information does not necessarily translate into great trust in that source. However, when a health care professional (the most trustworthy source by far, according to respondents) is not available to provide needed information, a less trustworthy source may be the next best option. In the case of e-health searching, convenience and availability may trump information quality.

Website Evaluation

A qualitative analysis of the comments made concerning the Medicinenet article revealed interesting patterns in the ways in which searchers evaluate e-health websites, despite the fact that these value judgments were unrelated to CIAAS scores. Though most participants felt that the site was a good source of health information, the explanations as to why the site was or wasn't reliable revealed the subjectivity of e-health source assessment. Many aspects of the site, for example, ended up in both the positive and negative column. Compare the following paired list of comments concerning the site's use of advertising:

Table 6	
<i>Paired comments concerning Medicinenet advertisements</i>	
POSITIVE	NEGATIVE
"It's [sic] advertisements are few in number and specialized and related in content [sic]."	"Has pharmaceutical advertising, which is both annoying and would make me question the integrity of the site."
"appropriate ads"	"It is filled with advertising for drugs to treat fibromyalgia and miscellaneous links to things not related to the condition."
"the ads seemed to mostly be ads for medicines or medical stuff (not scam ads)"	"too many ads from drug companies that make fibromyalgia drugs for my comfort."

Those participants with a positive opinion of the site tended to put a positive spin on the advertising; the ads were acceptable to these searchers because they were relevant to the content of the article. Those searchers with a negative opinion also noticed the relevance of the ads, but felt that that relevance (i.e., ads for pharmaceuticals directed toward sufferers of the very disease under discussion) was a telltale sign of source bias. Similar “paired” observations concerned content (positive: “Useful diagrams and graphics”; negative: “Grotesque illustrations”) and design (positive: “Good page layout”; negative: “Too busy”). Clearly, though participants have strong opinions concerning the site, there are few rules being followed here—instead, participants appear to have made their judgments based mostly on personal preferences. Catering to the factors that participants notice most frequently (comprehensive and well-organized information, for example) may help medical websites bolster their credibility—however, when each participant’s definition of “comprehensive” and “well organized” is different, pleasing everyone becomes a greater challenge.

When participants were asked if they would consider sharing the information found on the Medicinenet site with a doctor, the results were somewhat unexpected. Among those who felt the site was a good information source, the vast majority (69.2

percent) reported that they would feel comfortable sharing the information with a doctor. However, among those who did *not* feel that the site was a good information source, 39.1 percent said that they would still feel comfortable sharing the information with a doctor. Only 39.1 percent of this group, an equal number of participants, said that they would not. This seems odd, especially considering the extremely negative tone of the comments made by those who distrusted the website. As an example, the following is a sampling of comments from participants who reported distrusting the website, yet said that they still would share the information with a doctor:

“There is too much advertisement and glitz to seem reputable.”

“too many advertisements would make me skeptical about quality of information”

“Presence of advertizing material suggest bias [sic]”

These comments suggest that the participants not only disliked the site, but also distrusted the information presented there. Their continued willingness to discuss that information with a doctor is curious, and reveals that people may be willing to make use of e-health information that does not otherwise meet their personal quality standards.

Conclusion

This study’s findings emphasize the necessity of education among anxious computer and Internet users, as they are less likely to successfully find e-health information, and are less likely to be satisfied with the quality of e-health information. This effectively creates an information gap between low- and high-anxiety searchers, though both groups presumably have the same information needs. If, as shown in this study, moderate (or even high) levels of computer and Internet anxiety are not actually

preventing searchers from using the Internet as a primary source of health information, it is clear that both health and information professionals must make an effort to reach this user population.

User education efforts are a good start, though it is unrealistic to expect that a great many e-health seekers will voluntarily enroll in computing, Internet, or e-health searching courses. It is more reasonable to expect health and information professionals to discuss e-health searching with patients and patrons, hopefully giving anxious users the tools necessary to successfully find quality information.

Incorporating acknowledged best practices into sites that many searchers already visit (e.g., WebMD) may ultimately reach more people and prove more effective.

Prominently displaying trust marks (such as the HONCode symbol, which often goes unnoticed in the footer of reliable e-health websites), author credentials, and links to e-health search guidelines (such as the Health on the Net Foundation's list of guidelines, found at http://www.hon.ch/HONcode/Patients/visitor_safeUse2.html) on the most popular sites could make users of all anxiety levels more likely to notice the presence (or absence) of these items on other e-health websites they encounter. It is essential to recognize that teaching anxious users how to discern quality e-health information is perhaps as important as providing the information itself.

Ybarra and Suman (2008) also emphasize the need for the best sites to remain vigilant in making sure they are "engaging, highly rated and approachable" (p. 518). Though eye-catching design and interactive features may seem superficial when compared with the importance of quality information, this study's findings prove that these features are essential to attract users and gain their trust. This trust, once earned,

may help to establish a long-term relationship between a user and a single site, drawing the user in again and again even as his or her specific e-health information needs change. Being able to consistently access a single trusted, comprehensive source may help to alleviate users' anxiety concerning the overwhelming amount of e-health information available.

High-quality e-health websites must also engage in continual search engine optimization in order to maintain a place on the first page of search engine results. The ten to fifteen results appearing on the first results page of a Google search represent only a narrow sampling of available e-health information, and competition to retain a position there is fierce. Users' reticence to move past the first page may be inevitable, so ensuring that many of the first-page results are of high quality will increase the chances that users of all computer competency levels will quickly find quality information.

Study Limitations and Future Work

The current study has several limitations. First and foremost, the use of an online survey necessarily limited the sample population to somewhat savvy Internet users. It should also be noted that a 2009 Pew study found that 63 percent of Americans have adopted broadband at home; the fact that almost 95 percent of this study's participants have home broadband suggests that the group under study is more exposed to the Internet than the American population at large. As expected, the distribution of CIAAS scores among participants was therefore skewed to the right; as a whole, this was almost certainly a less computer-and-Internet-anxious group than a more random, paper-and-pencil survey sample might attract.

Moreover, demographically, the sample population was heavily female in its makeup (over 83 percent). The large number of females was expected, as this has been the case in many previous studies of e-health information searching. In general, women seem to be much more likely to concern themselves with e-health searching than men (Pew, 2006; Atkinson, Saperstein & Pleis, 2009). Aside from gender, it should also be noted that a significant percentage of study participants (48 percent) reported holding post-graduate degrees. Though neither gender nor education were revealed to be statistically significant in this study, it is certainly conceivable that different results could be seen in a more educationally and gender-diverse sample.

A future study could be undertaken to actually observe the search behaviors of anxious e-health searchers in a laboratory environment. In this study, participants were able to self-report their search behaviors, but as has been seen in previous studies (notably, Eysenbach & Köhler, 2002), participants in survey research often report idealized versions of their behaviors. Observing actual behaviors in a lab could potentially generate very different results.

It would be especially informative to recruit participants for observation who actually had a specific e-health information need (for example, a particular condition that they wanted more information about), rather than having participants search for a pre-determined set of topics. This would add a new dimension to this study, which could examine computer and Internet anxiety in the context of a *personally important* health search—not just e-health searching in general.

The ubiquity of the Internet and its ever-increasing popularity as a source of health information makes this an opportune time to pursue additional research in this

area. The current study emphasizes that it is essential to ensure that all searchers, and not just computer-savvy individuals, are equally able to access high-quality health information. With a combination of user education efforts and the incorporation of best practices into the top websites, anxious users may eventually achieve the same level of satisfaction with e-health information as more confident users, thereby closing an unfortunate information gap.

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Appendix A: Online Survey

Please read the following information before continuing.

This survey is designed to collect information about the ways in which you search for health information online. The survey should take you approximately 10-15 minutes to complete. Participation is voluntary; you may refuse to answer any question, or decide to discontinue taking the survey at any time. All responses are anonymous. You must be 18 or older to take part in the survey. By answering "yes" below, you certify that you are 18 years of age or older, and that you have read and understand the above information. Do you wish to continue with the survey?

Yes (1)

No (2)

If No Is Selected, Then Skip To End of Survey

Demographic information:

1. Gender:

Male (1)

Female (2)

2. Age:

18 - 24 (1)

25 - 34 (2)

35 - 44 (3)

45 - 54 (4)

55 - 64 (5)

65 + (6)

3. Years of education:

Some high school or less (1)

GED or high school graduate (2)

Some college or technical school (3)

College graduate (4)

Some post-graduate work (5)

Post-graduate degree (6)

4. Do you have an Internet connection at home?

Yes, I have a broadband connection. (1)

Yes, I have a dial-up connection. (2)

No (3)

Answer if "Do you have an Internet connection at home?" (No) Is Selected

4a. If you do not have Internet at home, where do you access the Internet most often?

- At work (1)
- On a mobile device (2)
- At a library (3)
- At a friend or relative's house (4)
- Other (specify): (5) _____

5. On an average day, how much do you use the Internet?

- 8 hours or more (1)
- 3 to 7 hours (2)
- 1 to 2 hours (3)
- Less than 1 hour (4)

6. For each line item below, click the response that best describes your opinion.

- Strongly disagree (1)
- Slightly disagree (2)
- Neutral (3)
- Slightly agree (4)
- Strongly agree (5)

I am comfortable changing (installing/upgrading) computer software. (1)

I enjoy learning to use new software programs. (2)

Email is an easy way to communicate with people. (3)

I avoid using computers whenever possible. (4)

My friends often ask me computer-related questions. (5)

I feel like a fool when I am using a computer and others are around. (6)

I enjoy using computers. (7)

When I use a computer, I am afraid that I will damage it. (8)

I must have a reference manual or a help file to run computer software. (9)

When using the Internet, I quickly find the information that I am looking for. (10)

I avoid online shopping because I don't like to give out my credit card information on the Internet. (11)

I can surf the web quickly. (12)

I'm usually successful at finding what I am looking for when searching the Internet. (13)

I can easily identify "scam" websites if I encounter them. (14)

I feel safe when surfing the web. (15)

7. Have you searched for health information on the Internet at least once in the last 6 months?

- Yes (1)
- No (2)

8. Using the numbers 1 through 4, rank the following resources in the order you would access them if you were looking for health information, with 1 being the resource you would access first.

- _____ Health care professional (1)
- _____ Internet (2)
- _____ Books, newspapers, or magazines (3)
- _____ Friend or family member (4)

9. Using the numbers 1 through 4, rank the following sources of health information in terms of how trustworthy you find them, with 1 being the most trustworthy and 4 being the least trustworthy.

- _____ Health care professional (1)
- _____ Internet (2)
- _____ Books, newspapers, or magazines (3)
- _____ Friend or family member (4)

For the following two questions, consider the following query: “How much ibuprofen is it safe to take in a 24-hour period?”

10a. If you wanted to use the Internet to find an answer to this question, where would you start your search?

- Search engine (e.g., Google, Yahoo!) (1)
- Specific medical website (e.g., WebMD, Mayo Clinic) (2)
- Other (specify): (3) _____

10b. What term(s) or phrase(s) might you type into a search box on a website or search engine to find this information? Type your response exactly as you would type it into a search engine.

11. When using a search engine to find online health information, if you do not find the information you’re looking for on the first page of search results, are you most likely to:

- Go to the next page of results (1)
- Change your search terms (2)
- Use a different search engine or website (3)
- Stop searching (4)
- Other (specify): (5) _____

12. If you ever cannot find the health information you’re looking for on the Internet, do you...

- Assume the information is not available on the Internet (1)
- Assume you are not using the right search terms (2)
- Assume you are searching in the wrong place (3)
- Other (specify): (4) _____

13. In general, how often do you feel your online searches for health information are successful?

- Never (1)
- Rarely (2)
- Sometimes (3)

Often (4)

14. In general, how satisfied have you been with the quality of health information you've gotten from the Internet?

Very Dissatisfied (1)

Dissatisfied (2)

Neutral (3)

Satisfied (4)

Very Satisfied (5)

15. Do you ever share health information that you've gotten from the Internet with your doctor?

Never (1)

Rarely (2)

Sometimes (3)

Often (4)

Please read the following instructions before answering the questions on this page.

When you click the hyperlink below, a health information website will open in a new browser window. Take a few moments to look over the webpage. It is not necessary to read all of the text--simply examine the page and some of the content to get an overall impression. Then answer the following questions.

[Click here to open the article.](#)

16. After looking over the website, would you consider using this resource in the future as a good source of online health information?

Yes (1)

No (2)

I don't know (3)

17. Please briefly describe the aspects of the website that led you to your answer to the previous question.

18. Would you feel comfortable sharing information from this website with your doctor?

Yes (1)

No (2)

I don't know (3)

Appendix B: Medicinenet Screenshot



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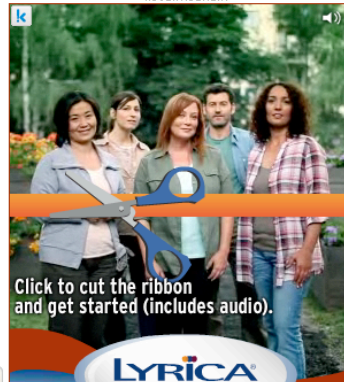
Medical Author: [William C. Shiel Jr., MD, FACP, FACR](#)
 Medical Editor: [Melissa Conrad Stöppler, MD](#)

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- [What causes fibromyalgia?](#)
- [Who does fibromyalgia affect?](#)
- [What are fibromyalgia symptoms in men and women?](#)
- [How is fibromyalgia diagnosed?](#)
- [What are medications and other forms of treatment for fibromyalgia?](#)
- [What is in the future for fibromyalgia therapy?](#)
- [Where can people find more information about fibromyalgia?](#)
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